REMARKS begin hereinbelow.

REMARKS

The Specification as set for in Attachment II reflects amendments to each paragraph and the addition of headings with the result that the Specification is no longer informal.

The Claims as set forth in Attachment III reflect amendments to each claim to overcome the rejection of the claims under 35 U.S.C.§ 112, second paragraph. With the amendments, it is respectfully submitted that the rejection be reconsidered and withdrawn. Claims 1-17 remain in the application.

Claims 1-17 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Gross et al., U.S. Patent No. 6,218, 961, in view of Hassett et al., U.S. Patent No. 5, 289,183. The rejection is respectfully traversed.

With the amendment of claims 1-17, it is respectfully submitted that the above-cited combination of references fail to teach the invention.

Having amended the Specification and the Claims and submitted Remarks in rebuttal to the Detailed Action of the Examiner, it is respectfully submitted that the application is in condition for issuance of a Notice of Allowance.

A petition for an extension of three months to Sunday September 28, 2003 in which to respond has been submitted concurrently with this Reply.

The Examiner is invited to contact Andrew F. Reish, at (703) 264-2220, in the Washington, DC area, in order to discuss any matters that may remain outstanding in this application.

Respectfully submitted

DAVID, BRODY & DONDERSHINE, LLP

By: _____
Andrew F. Reish
Reg. No. 33,443

12200 Sunrise Valley Drive, Suite 100
Reston, VA 20191
(703) 264-2220

ATTACHMENT I

METHOD AND SYSTEM FOR AUTOMATICALLY DETECTING OR MONITORING THE POSITION OF AT LEAST ONE GUIDED VEHICLE

FIELD OF THE INVENTION

The present invention concerns a method for the automatically locating and monitoring the position of at least one track-guided vehicle, especially rail-vehicle, and for the emission of warning signals, whereby within the vehicle, preferably the position of the vehicle will be continuously located and surveyed by the means of a combination of transmission devices, respectively transmitter - receiver units, which are arranged in the zone near the tracking of the rails, the resulting data in connection with the driven distance will be compared with a predetermined and previously given data concerning the vehicle-move on an indicated distance.

The present invention concerns also a system for the automatically locating and monitoring the position of at least one track-guided vehicle, especially rail-vehicle, and for the emission of warning signals, whereby within the vehicle, preferably the position of the vehicle will be continuously located and surveyed by the means of a combination of transmission devices, respectively transmitter - receiver units, which are arranged in the zone near the tracking respectively the rails, the resulting data in connection with the driven distance resulting data will be compared with a predetermined and previously given data concerning the vehicle-move on an indicated distance.

BACKGROUND OF THE INVENTION

There are already different systems known in connection with the problem of locating and monitoring of the position of at least one track guided vehicle, especially a trail-vehicle and for emission of warning signals.

For instance, it is already known that each rail-vehicle is connected at least with one control and guiding station by the means of an adequate control- and signal transmission system, especially radio-system, whereby the controlling and surveillance of many other rail-vehicles which are situated in a certain limited region, will be done through this above mentioned control and guiding station. In connection with this matter, one can refer to the DD-B 292 880, the US-A 5 129 605, the US-A 4771 418, the WO 93/15946, the DE-A 43 31 931 and the DE-A 41 23 632.

Furthermore., it is already known that rail-vehicles and other vehicles in general are controlled by the means of surveillance satellites, whereby in connection with this matter it can be referred for example to the DE-A 42 44 624. The disadvantage in this kind of systems and procedures is that in particular the surveillance, of each signal transmission had to be accomplished through a controlled and guiding station or the like. Consequently, if a defect or an error take place in the above mentioned guiding and control station, or if an error or fault in the controlling system or in the transmission of data between the control and guiding station and the individual rail-vehicle, particularly vehicles, have a negative influence on the procedure, so the required security and reliability of the locating and surveillance systems, cannot be guaranteed any more. Another disadvantage of such known methods for

controlling through satellites is, that a certain positioning-deviation through satellites is deliberately done by the satellites management. A reliable and accurate position of the rail-vehicle can be obtained in this case, by the elimination of this deviation which can be accomplished only by the deployment of additionally expensive and complicated equipments; furthermore and according to topographical reasons it may come to unsatisfactory data reception from four satellites at the time, which is very important for the required conditions to obtain a perfect positioning whereby in some regions or for example in tunnels, the reception from satellite will be partially or totally disturbed. In connection with the satellites positioning systems, it is obvious that high performance transmitting and reception units are needed, which are capable of dispatching the signals to another distant control or guiding station.

The DE-A 197 15 773 describes another procedure for securing the operational guiding system of a rail-vehicle by the use of safety devices, in which the locating is once again realized through satellite locating system, whereby a great amount of information concerning the position etc. is accomplished through different safety devices, from which some of them are stationary and others are installed in another rail-vehicle.

A procedure as well as a system like the sort of above-mentioned is e.g. as one can see in the US-A 5 364 074, the EP - A 0 479 529 or the WO 94/05536, whereby it is tried, to trace the position of a vehicle with the help of transmitter-receiver-units along the route and to compare with the data related to distance. Furthermore in these known types special data are transmitted to a control station, which can transmit the data related to the train to further rail-vehicles.

The present invention is directed to the creation of a method as well as at a system to locate and survey the position of at least one track-guided vehicle, especially a rail-vehicle, and at the emission of warning signals, with which the reliability and security of availability can be enormously increased, whereby especially mistakes in the control station and problems of an information exchange between one vehicle and such a control station may lead to a totally complete falling out of the system and combined with this to security-risks.

In order to solve these problems, the present invention for automatically detecting and monitoring the position of at least one track-guided vehicle, especially of a rail-vehicle, and for the emission of warning signals of the above-mentioned kind is essentially characterized through that when dangerous situations arise, the vehicle sends warning signals at least to other vehicles being in the local close zone, especially to other vehicles which use another distance than the immediate practicable distance. As in the vehicle, preferably continuously, the position of the vehicle is located and surveyed and also compared with the previously given data, can the accordance of the determined and acquired data, e.g. the position, the speed, the time and the like be surveyed immediate in the vehicle by a determined distance without engaging a control station and resultantly immediate in the vehicle can be recognized, if differences to a previously given distance or the like occur.

Also other track-guided vehicles will be regarded as vehicles in the present invention beside the usual rail-vehicle vehicles, e.g. as robot-directed vehicles in warehouses or the like, which e.g. are directed along from tracks in the floor or the like and emit electromagnetic signals. Alternatively, it goes without saying, that vehicles being directed via other control systems are also included, which move alongside of determined tracks, whereas

crossings result similar to those like with such general, track-guided vehicles. These crossings must be separately controlled by the use of such eventual fully automatic driven and directed vehicles.

According to invention., it is furthermore foreseen, that the vehicle can send warning signals at least to other vehicles being in the local close zone whenever dangerous situations diverge from a determined track, occur, so that a essential element of this invention is, that a direct communication between vehicles lying or plying in the local close zone is possible, without absolutely inserting a higher ranking control station.

Viz-a-viz the types of the known state of the art, through this possibility of direct communication between vehicles being in the local close zone not only is the transfer time of the data, which indicate a dangerous situation, reduced respectively with the transfer of warning signals, but it is also possible to avoid respectively to enormously minimize additional safety risks, which eventually arise by mistake in a control station. According to invention it is possible to transfer the message of dangerous situations and warning signals to a corresponding control station, in order to provide especially for track-vehicles using inter-regional information exchange.

According to the proposed arrangement of transmitter-receiver units locating elements in the area of practicable rails, namely, tracks, enables the use of elements with very low transmitting power, which assures that only vehicles on the associated track can receive a particular direction signal.

A very favourable development in the present invention is, that the locating of a vehicle, especially of a rail-vehicle, is independent from each other in lengthwise direction as well as in transverse direction. Locating mistakes crosswise facing the engine therefore become negligible, and will be totally eliminated, whereas they essentially depend on the radiation lobe in the lengthwise direction of the tracks. Locating mistakes can be kept small by the correlative directionality of the transmitted wave, e.g. by laser. Low-cost transmitter-receiver units, provide a correlative exact locating with merely a single piece of equipment without using complicated additional systems, which are much more expensive with increasing frequency of mistakes.

A special advantage according to invention is, that an entire breakdown of the whole system, like with other systems, especially with those, which base on a satellite-receiver, is totally impossible, as according to invention there are autonomic units concerned, which either are installed mobile or stationary as stationary relay, in the rail-area or in main control station or collateral unit. These autonomic units together provide an automatic, individual and direct communication between other rail-vehicles, stationary relays, locating elements, control stations the like, which are in the local close zone.

Dangerous situations arise out of the variance of the security-system according to invention, which is foreseen in the vehicle, especially rail-vehicle and can e.g. be as follows:

- stop of a vehicle (danger of crash with a following vehicle)

- overrunning of a stop-point or signal, whereas the following danger-point is overrun

- a crash with a crossing or joining vehicle
- belated reaching of an intersection or of a shunt-area
- deviation of the prescribed route (other rail)
- uncontrolled undocking of a freight car or similar

In order to distinguish different dangerous situations, the vehicle sends different warning signals, so that other vehicles can react accordingly, as an emergency stop in the immediate danger of crash or a decrease of the speed, etc.

Alternatively, one could out of the emission of a widely standardized warning signal, under consideration of the mutual position of the vehicles, adequate countermeasures could be derived and begun.

According to a special preferred type of invention, it is proposed that the vehicle emits favourably analogue data concerning its position and identification to other vehicles, being in the local close zone and/or to control stations, so that other vehicles not only in dangerous situations in at least one local close zone are informed, but a continuous mutual control and communication concerning the most important keydata of the single vehicles is provided.

For a further increase of security, it is moreover proposed, that the vehicle receives preferably continuously information about the position and identification of the other vehicles in the local close zone and compares them with the determined data concerning the movement of an indicated distance and checks them for eventual dangerous situations, which

corresponds to a further preferred type according to invention, whereas a continuous communication with other rail-vehicles in the local close zone is not coercive.

In order to further increase the security, it is moreover favourably proposed, that it is preferably continuously controlled, if the warning systems is available and/or if the transmitter-receiver units installed in the area of the practicable rail and the trails are operating, and warning signals will be emitted when a mistake occurs and/or a stop of a vehicle is affected.

Such a check and control of the availability of the warning systems and a check of the operation of the transmitter-receiver units in the area of the practicable rails enables a further increase of the reliability of service of the whole system, whereas e.g. following situation of a breakdown, of one receiving system must be distinguished.

As already mentioned, the total breakdown of the system according to invention is not possible. A possible defect may arise either in one part of the system, which is located in the vehicle or at a locating element or a stationary relay. In all cases, in the above mentioned single-units of the security systems according to invention of self controlling-system, connected with an own sender and/or audio-optic signals be installed. This self controlling-system sends in case of a defect e.g. encoded warning signals to vehicles, especially rail-vehicles, stationary relays and/or control stations being in the local close zone, which identify and indicate the occurred interruption.

Beside such a check-up of the availability of the warning systems, also the transmitter-receiver units being installed in the area of the practicable rails and tracks, must regularly be controlled and checked, if they are operating, whereas in this connection if a mistake at a transmitter-receiver unit occurs, e.g. a message to the control station can be sent. In case that several vehicles each deliver a mistake or a defect of a special transmitter-receiver element, it is sure, that this transmitter-receiver unit is the defect, so that a repair of the defect has to be occasioned. Furthermore, it can be necessary to reduce the speed by braking of a vehicle to avoid potential accidents, with a breakdown of one of a special position provided transmitter-receiver-unit.

For another check-up of the system and a comparison of existing data with the determined route, a further preferred type is according to invention foreseen, that a accumulation at least of the data of the preceding transmitter-sender units is provided and these data together with the vehicle's identification data are given up with the emission of a warning signal. In this context, changes of the schedule carried out through a control station can be considered and if necessary, confirmed. In connection with such a self controlling of the availability of the warning systems and a check-up of the operability of the single transmitter-receiver units, especially at special positions, respective redundant systems, which can control itself, can eventually also be provided.

For an orderly and exact localization of the position of the transmitter-receiver-units, provided in the area of practicable tracks and rails, it is further proposed according to invention, that the transmitter-receiver units, installed in the area of the practicable rails, are furnished with an encoding, e.g. with geographic coordinates, whereas beside geographic

coordinates, e.g. additional identification marks can be conducted. Such a definite identification of transmitter-sender units in the area of the practicable rails permits also for rail-vehicles the construction of an interregional/international system with respective encoding of the rails and tracks in an inter-regional area.

An encoding and control of the transmitter-receiver units of the in the area of the rails provided units can also be carried out e.g. by laser and therefore immediately a check-up can be done, without a further communication between the units in the area of the rails and the units in the vehicles.

In order to assure a reliable communication and transfer of data between different systems of vehicles, especially within the international traffic, a further preferred embodiment of the invention is proposed in this way, that warning signals preferably are transferred by international signal- and warning frequencies.

Beside the above-discussed method according to invention for the locating and monitoring of the position of at least one vehicle and for the emission of warning signals, a system to solve the above-mentioned tasks is moreover proposed. This system for the automatic locating and monitoring of the position of at least one track guided vehicle, especially rail-vehicle, and for the emission of warning signals, whereas there is at least one unit for locating and monitoring of the position under assistance of a sender-unit or combined transmitter-receiver-units, which are installed in the area of the travelling on tracks and rails and for the comparison of determined and previously given data with data concerning an indicated distance to be moved. Furthermore, it is foreseen, that a unit for emission and for

receiving of warning signals at least to other vehicles, being in the local zone, especially to those, which drive on another distance than the immediate driving on route, merely when dangerous situations occur.

The system according to the invention provides a reliable control of a vehicle's route, especially of a rail-vehicle, as well as a comparison with a determined parameter of a indicated distance as well as in the case of the occurrence and identification of dangerous situations at least the immediate emission of warning signals to other vehicles and eventually additionally to control stations, being in the local close zone.

According to a special preferred embodiment of the invention, it is proposed in this connection, that the equipment, installed in the area of the rails and tracks, consists of at least a unit for emission of a signal respectively encoding, which shows the position of the unit, e.g. of geographical coordinates, whereas a simple control of the position of a vehicle while driving on a route is provided, whereas in this connection moreover it is proposed, that a unit for receiving and registering of a vehicle's keydata is additionally foreseen.

According to another preferred type of the invention it is proposed, that in the vehicle, units for locating and monitoring the position as well in the front area of the vehicle, especially in the locomotive or in another actuation element, as well as in the rear area, especially in the last freight car, are foreseen, whereas especially with long vehicles, e.g. freight trains, which eventually drive rather slowly, the required time for the driving on a determined route-section can be considered and., at the same time., it can be controlled if the whole train is complete.

Beside the check-up of the completion of the train vehicle, it is possible to reach e.g. by overrunning of shunts/turnouts a higher control and security, as well for the beginning and as for the end of a rail-vehicle, the correct driving on a shunt/turnout can be controlled. It is hereby preferable, to use control means, with which the front end of a vehicle corresponds to a closed circuit condition and the aft end to a turn out-modus, so that always it is assured, that a vehicle e.g. had completely left a crossing, before the freeing of the route is carried out.

Because of the automatic control, it is possible to make a respective contact between the system in single vehicles or also to recognize, if a vehicle is not equipped with the system according to invention.

For an automatic and simplified control and controlling means, it is moreover foreseen, that the units for locating and monitoring the position in a vehicle, for comparison with data and for emission concerning the route and receiving of warning signals, connected with a common control- and computer-unit or preferably integrated in this unit, as this corresponds to a further preferred type according to invention.

For an automatic control possibility to avoid accidental situations with the location of potential dangerous situations, it is furthermore proposed according to invention, that the equipment for emission and receiving of warning signals is coupleable with driving parameters of the vehicle, e.g. a reduction of the speed by braking, and is feasible, so that e.g. by locating of dangerous situations through influencing the drive-parameter, e.g. through a reduction of the speed by braking, accidental situations can be self-instructed and automatically be avoided without delays, whereas such a delay would be caused by e.g. not an automatic communication systems.

As above suggested, it will be achieved in the range of the method according to the invention as well as the system according to invention, with simple transmitter-receiver-units with low power, whereas in this connection according to a further preferable type of the invention it is proposed, that the in the area of the tracks and rail, provided units include transponder and/or emission-units for a laser mark. For a simple transfer of the signals respectively warning signals it is proposed according to a preferred embodiment of the invention, that the transfer of signals, especially warning signals, is carried out via radiotelegraphy or cable-connections, especially glass fiber cable via the rails.

In order to check-up and control concerning the operating and the availability of the systems according to the invention, it is proposed according to a further preferred embodiment of the invention, that the vehicle additional indictors, especially traffic light equipment, for indicating the operability of the system, are foreseen. In this way, especially a visual control concerning the readiness for service of the system is possible, whereas, e.g. traffic signals as well. outside at the rail-vehicle a control by passing by rail station/railroad depot and as also in the freight cars can be a moderation for the passengers. The invention is explained in the following by the enclosed figures showing the diagrammatic viewed examples of the system according to invention for carrying out the method according to the invention.

BRIEF DESCRIPTION OF THE FIGURES

Fig. 1 is a diagrammatic view of a system according to invention for locating and monitoring

the position of at least one vehicle, especially of a rail-vehicle, for carrying out the system according to invention;

Fig. 2 is a diagrammatic view of the different signal- and wireless-elements;

Fig. 3 consists of Figs. 3a and 3b which are schematics of the possibilities of a vehicle's connection with transmitter-receiver-units of a higher control-station;

Fig. 4 is a block-diagram for a system according to invention for locating and monitoring the position of at least one vehicle and for emission of warning signals for carrying out the method according to invention with further poke-home transmitter-receiver-units; and

Fig. 5 is a diagrammatic view of a transfer of signals between vehicles, especially rail-vehicles.

DETAILED DESCRIPTION OF THE INVENTION

With the system for locating and monitoring the position of at least one track-guided vehicle, especially of a rail-vehicle, and for emission of warning signals, it succeeds through an early emission of warning signals for avoiding accidents by means of a direct communication between vehicles being in an immediate local close zone with the help of direct connections under use of especially international alarm- or warning frequencies.

The following description refers to a type of realization in connection with rail-vehicles. Alternatively, the vehicle can be constituted e.g. of self-driving automatic

prosecuted vehicle, which drive an along determined tracks respectively railroads, whereas leading tracks are developed e.g. in a ground area, which emit electro-magnetic rays for leading or guiding of such vehicles. In this ways such tracks and guiding rail-roads replace the rails of a rail vehicle.

In this connection., a locomotive is indicated by 22, in Fig. 1, which drives on a schematic with 21 being the marked distance, whereas in the distance, e.g. between the stretch of rails and the rail road ties, a number of transmitters 18 is provided, which will be explained in detail in hereinbelow.

In the locomotive 22, there are respective receiver- and eventually transmitter-units integrated, which under the reference to Fig. 4 will be discussed in detail. Further, at mark 22', the last segment, namely, the last wagon of the train there is also a receiver-unit provided, so that especially with long trains the necessary time for the passage of trains of a distance can be considered and eventually the completion of the train respectively the proper passing over of the turnout can be controlled.

Through the comparison of the determined data, emitted by the transmitters 18 and from the respective receiver-units as in the locomotive 22 and as well eventually in the last wagon 22' provided signal-receiver-units concerning the distance to be travelled on it succeeds a simple control of proper traffic, whereas upon occurrence of dangerous situations a difference from the determined data an emission of signals is made possible, as will be discussed in detail with respect to the following figures. In this connection in Fig. 1, with 30 schematically implying the emission of warning signals, whereas 24 implies a receiver--antenna.

The reference-marks for the same components in Figs. 2 and 3 are the same like in the preceding figure. The element 24 marks a receiver-unit at a rail-vehicle marked as 22, which is driving on the distance 21 e.g. in the direction of the arrow 32. In Fig. 3b there is further implied a control-station 27 and an additional receiver-unit 26.

In the block-diagram according Fig. 4, the processing and emission of respective control-signals with the driving on of a distance is hereby especially detailed implied. In Fig. 4, there is an arithmetic unit respectively control-unit marked with 1, whereas signals are transmitted via lines 10, 11 from the duplex-units 3, 4 to the control-station 1. The duplex-units 3, 4 are connected to the transmitter-units 18, which are integrated in the distance. Further signals of a duplex-unit 8 are transmitted via a control line 9 to an arithmetic unit 1, whereas the duplex-unit 8 is connected with a duplex-unit 19. In Fig. 4, the marks 5, 6 and 7 in identifiers of schematic determined data concerning the distance to be driven, which are provided via the control lines 12, 13 and 14 to the arithmetic unit 1. Mark 5 is e.g. a timing pulse generator, 6 is e.g. an electronic map, in which a rail net with respective geographic data and the position of the single transmitter-units 18 are shown, as they are integrated in the distance, while mark 7 indicates a detailed plan of the distance to be driven, which is coupleable with another transmitter-receiver-unit 17. According to a comparison of the real position-data, provided by units 3 and 4, with those provided by 5, 6 and 7 to the arithmetic unit, the compatibility of the driven distance of trail-vehicle 22 with the determined and pre-stored data can immediately be ascertained. The units 18, 19 which have to be provided in the distance can be protected from interferences and eventually modularly removable, e.g.

created like a black-box. Furthermore respective encoding for the distance, the position of the transmitter-units 18 and such like, can be foreseen.

Furthermore, the transmitter 19 has an additional function in Fig. 4. It controls when the driving past rail-vehicle is without a security-system or a vehicle with a non-operational security system ("problem-vehicle"). In order to recognize "problem-vehicles", it is necessary to install at the beginning of the distance, which is equipped with locating elements according to the security system of the invention at stationary points of danger, e.g. after the last turnout of a railway station, before and after turnouts, crossings and/or others, grade crossings, etc., a "registration-system" (Fig. 4, transmitter 19 and 20), in order to recognize a "problem-train" and to emit warning signals in case of necessity, what is working like that: If the transmitter 19 (only for question and answer from the train) does not receive an answer to its enclosed, transmitted signals from the driving past rail-vehicle, it recognizes that as a "problem-train" and induces the activity of the transmitter 20, which sends encoded warning signals via wireless and/or communication-cable e.g. to trains in the local zone, stationary relays and main- and/or side-control stations. The transmitter 19 can also induce the activity of visual and acoustic signals. The transmitter 19 can be activated through a driving past rail-vehicle, e.g. via a commonly known magnetic-relay, magnetic-relay, magnetic-rail-contact, wheel sensor and the like. Because of this activity the transmitter 19 sends a signal via antenna 23 to the driving past rail-vehicle, whereas it, if it does in case not receive an answer from of the driving past rail-vehicle to these encoded, transmitted signals, recognizes this vehicle as a "problem-train", which either is not equipped with a security system or consists of one that does not operate. Furthermore, in Fig. 4, mark 2 is a duplex-receiver unit implied, with which respective information of other rail-vehicles being in a local close zone are

received and through which data of the rail-vehicle from the arithmetic unit 1 to other rail-vehicles being in a local close zone can be transmitted, whereas signal lines are implied with 15 and 16. Comparing the provided data through the duplex-unit 3 and 4 with the determined data 5, 6 and 7 and those of others rail-vehicles received data via the unit 2, immediate statements above eventual possible dangerous situations, whereas by occurrence of such dangerous situations respective warning signals, as implied through 31, can be emitted. Furthermore, through the unit 1, while receiving signals indicating a dangerous situation immediate e.g. the actuation of the rail-vehicle can be influenced, so that automatically a speed reduction by braking can be carried out.

The transmitter-units 18 respectively 19, which are integrated in the distance, can hereby contain beside the exact position also a respective encoding, in order to enable the simplified control of the position of a rail-vehicle. In Fig. 4, there is hereby additionally implied, that beside the unit 19 also a transmitter 20 can be foreseen, which by recognizing problems in connection with a driving past rail-vehicle immediately via the antenna 23, which also in Fig. 3b is schematically implied, enabling a notification and release of an alarm to a control station or a transmitter 26 and 27, whereas transmitter 20 emits respective warning signals.

In this connection it can be recognized, if a rail-vehicle is not equipped with such a system respectively if a breakdown of the system happened. Beside wireless signals, it is also possible to transfer signals via cable or to emit visual signals, if a wireless communication, as e.g. in a tunnel, beside military check points or airports, is not easily and not possible at all or light signals supporting are implanted.

The system according to the invention hereby can integrated without further problems in already existing rail nets and rail-vehicles with low costs and simply under use of already known transmitter-receiver-units, whereas especially through the implementation of international alarm- or warning frequencies also a simple modulation between train systems., eventually from different countries can be enabled. Hereby, it needs merely very small building instruments with low consumption of electric energy, which eventually can be operating for the distance having integrated elements with solar cells or long-term batteries, whereas under warranty of effective output and long functional duration an independence of an external supply of energy, e.g. via electric lines, is enabled. As respective duplex-units are integrated in stationary relays as well as transmitter-units, the assembly and application will be furthermore simplified.

The system according to the invention and especially the transmitter-receiver-unit implied in Fig. 4, to be arranged in a rail-vehicle, which via the signal piece parts essentially take the control, can eventually be foreseen also in a portable unit, so that rail-vehicles either can be easily retrofitted or, in the transnational traffic, can be easily installed in rail-vehicles, which are not yet equipped with the system according to invention, in order to enable a reciprocal communication with other rail-vehicles under a standardized system.

Furthermore, it is possible to transfer the signals with already known equipment in a reliable way either in the form of merely warning signals or a continuous transfer of data of the single rail-vehicles to other rail-vehicles being in a local close zone or additionally to higher ranking control stations.

In Fig. 5, there is a schematic crossing-situation at several trails 34, 35 and 36, whereas the trails 34 and 35 are parallel and cross a trail 36. According to the invention,

such a crossing marks for the system a stationary dangerous point, which has to be controlled and to be reorganized, at which e.g. at least two rail-vehicles can meet one against the other. Other stationary dangerous points are e.g. rail road crossings with streets or other grade crossings. Opposite to that variable dangerous points are situations, whereas e.g. a rail-vehicle eventually because of a mistake or breakdown stands still or overrides a stop-point or a signal, so that a collision with following or previous rail-vehicles is possible. The single rail-vehicles must be able to recognize, if the coming in warning signal of one rail-vehicle in the nearby is relevant for the continuation of the train ride for if the rail-vehicle had already passed a dangerous point, no reaction is necessary.

In connection with the control of stationary dangerous points, control of grade crossings can be carried out in this way of an area-monitoring or a monitoring of such a grade crossing with light-barriers, inductive loops or weighing equipment, so that a hanging up vehicle, which had not yet entirely left a track, can be detected and in this way through the emission of respective signals via the in the track-area implanted transmitter/receiver-units enable respective counter measures against other coming close rail-vehicles similar to an already-known automatic control while coming close to an automatic shutting gate installation. If a road-vehicle stands still on a railway-crossing, consequently, it is possible, to send a warning signal to rail-vehicles entering the close zone, e.g. through the implementation of a speed-depending activation of a safeguarding plant of a railway-crossing. Also the speed-depending self-instructed operation, wherein the vehicle at the signal box self-instructed releases the adjustment of the train track, would be possible, whereby results in a reduction of routine work for the operator of the safeguarding plant.

As it is shown in Fig. 5, the schematic indicating rail-vehicle 37, which moves in direction of the arrow 38, emits warning signals, as reflected by the arrows 39. For a rail-vehicle 40, which moves in direction of the arrows 41, the received warning signals are not relevant any more, as the rail-vehicle 40 had already passed the crossing between the rails 34 and 36. Opposite to that the emitted warning signals for the rail-vehicle 37 are relevant for a further rail-vehicle 42, which also is moving in direction of the arrow 41, in order to avoid a collision in the area of the intersection between the rails 34 and 36. In case another rail-vehicle 43 on the track 35 can also receive the warning signals, so these warning signals for this rail-vehicle are not relevant anymore. However, for the other rail-vehicle 44 and 45, which come closer to rail-vehicle 37 corresponding to arrow 46, these warning signals are relevant, so that either an immediate speed reduction by braking of all vehicles must be carried out or at least it must be attempted, so that vehicles 44 and 45 can resort to track 35 via respective turnouts, such not being described in detailed.

In the area of the tracks respectively rails 34, 35 and 36 respectively transmitter/receiver-units are hereby implanted in regular space for monitoring the position, whereas one of these transmitter/receiver-units is marked with 47. These transmitter/receiver-units 47 can hereby consist of, beside the geographic co-ordinates, additional data about a special track and such like, whereas with respective inter-regional numbering of the track plants also e.g. transnational systems can be constructed.

A later adjustment or change of schedules respectively of set values, especially in the rail-vehicles, is simple and easy to be accomplished, e.g., from main- and/or side control stations, through the already known methods of wireless via the transmitting of encoded

signals to the system part according to invention integrated in the rail-vehicle, in order to carry out the desired adjustment or change automatically, whereas the main- and/or side control stations must receive a reply-confirmed answer from the system (automatic transfer of a change). It is additionally possible, that the locomotive drive receives e.g. by wireless an order to change, whereas arrangements must be made to avoid misunderstandings. The permission for such a change can only be enabled by use of a protected password, that is received from a main- and/or side control station by wireless, internet and/or such like. The locomotive driver must confirm the received information through an immediate reply-message to the main and/or side control station, preferably written, e.g. via internet, or also orally, in order to avoid any kind of misunderstanding and thereby guaranteeing security.

If a further rail-vehicle stands stationary and does not drive or for longer time is not permitted to continue the journey, it emits warning signals, in order to inform of eventually following rail-vehicles of the unchanged stop.

It is a further advantage of the system, that the current position of all rail-vehicles while driving on a particular route can be identified on a switchboard at the station management or monitor control, and not only, as presently usual, e.g., by wireless between rail-way stations and control stations. Such a detection can be carried out without any contact by wireless or without the use of communications elements and in this way without deviation of the locomotive driver, which means, if no warning message is received regarding the rail-vehicle, that a train systematically and without any interruption had passed its route and is on its way between locating points being defined as set locating points.

Similar to the above-described types of performance for rail-vehicles as well as risky and dangerous situations are in general possible for track-guided vehicles, as also with such track-guided vehicles crossings with similar constructions result, where a close coming together of moving vehicles at the same time or a collision between them must be avoided in a reliable way.

While preferred embodiments of the present invention have been described, it is to be understood that the embodiments described are illustrative only and the scope of the invention is to be defined solely by the appended claims when accorded a full range of equivalence, many variations and modifications naturally occurring to those of skill in the art from a perusal hereof.

ATTACHMENT II

[Procedure and system
for an automatically locating and surveillance
of the position of at least one track-guided vehicle]

METHOD AND SYSTEM FOR AUTOMATICALLY DETECTING OR MONITORING THE POSITION OF AT LEAST ONE GUIDED VEHICLE

[I)] FIELD OF THE INVENTION

[0001] The present invention concerns a [procedure] method for the automatically locating and monitoring the position of at least one track-guided vehicle, especially rail-vehicle, and for the emission of warning signals, whereby within the vehicle, preferably the position of the vehicle will be continuously located and surveyed [whereby within the vehicle, the position of the vehicle will be, preferably continuously, located and surveyed] by the means of a combination of transmission devices, respectively transmitter – receiver units, which are arranged in the zone near the tracking [respectively] of the rails, the resulting data in connection with the driven distance [resulting data] will be compared with a predetermined and previously given data concerning the vehicle-move on an indicated distance.

[II)]

[0002] The present invention concerns also a system for the automatically locating and monitoring the position of at least one track-guided vehicle, especially rail-vehicle, and for the emission of warning signals, whereby within the vehicle, preferably the position of the vehicle will be continuously located and surveyed [whereby within the vehicle, the position of the vehicle will be, preferably continuously, located and surveyed] by the means of a combination of transmission devices, respectively transmitter – receiver units, which are arranged in the zone near the tracking respectively the rails, the resulting data in connection with the driven distance resulting data will be compared with a predetermined and previously given data concerning the vehicle-move on an indicated distance.

BACKGROUND OF THE INVENTION

[0003] There are already different systems known in connection with the [problematic] problem of locating [, respectively the surveillance] and monitoring of the position of at least one track guided vehicle, especially a trail-vehicle and for emission of warning signals.

[0004] For instance, it is already known that each rail-vehicle is connected at least with one control and guiding station by the means of an adequate control- and signal transmission system, especially radio-system, whereby the controlling and surveillance of many other rail-vehicles which are situated in a certain limited region, will be done through this above mentioned control and guiding station. In connection with this matter, [it can be referred to] one can refer to the DD-B 292 880, the US-A 5 129 605, the US-A 4771 418, the WO 93/15946, the DE-A 43 31 931 and the DE-A 41 23 632.

[0005] Furthermore, it is already known that rail-vehicles [, also] and other vehicles in general are controlled by the means of surveillance satellites, whereby in connection with this matter it can be referred for example to the DE-A 42 44 624. [Disadvantage] The disadvantage in this kind of systems and procedures is, that in particular the surveillance, [respectively] of each signal transmission had to be accomplished through a controlled and guiding station or [alike] the like. [, consequently] Consequently, if a defect or an error take place in the above mentioned guiding and control station, [respectively] or if an error or fault in the controlling system or in the transmission of data between the control and guiding station and the individual rail-vehicle, [respectively] particularly vehicles, have a negative influence on the procedure, so the required security and reliability of the locating and surveillance systems, cannot be [guarantied] guaranteed any more. Another disadvantage of such known methods for controlling through satellites is, that a certain positioning-deviation through satellites[, which] is deliberately done by the satellites management. A reliable and accurate position of the rail-vehicle can be obtained in this case, by the elimination of this deviation which can be accomplished only by the deployment of additionally expensive and complicated equipments; furthermore and according to topographical reasons it may come to unsatisfactory data reception from four satellites at the time, which is very important for the

required conditions to obtain a perfect positioning whereby in some regions or for example in tunnels, the reception from satellite will be partially or totally disturbed. In connection with the satellites positioning systems, it is obvious that [a] high performance transmitting and reception units are needed, which are capable of dispatching the signals to another [far] distant control [respectively] or guiding station.

[0006] The DE-A 197 15 773 describes another procedure for securing the operational guiding system of a rail-vehicle by the use of safety devices, in which the locating is once again realized through satellite locating system, whereby a great amount of information concerning the position etc. is accomplished through different safety devices, from which some of them are stationary and others are installed in another rail-vehicle.

[0007] A procedure as well as a system like the sort of [the mentioned in the beginning] above-mentioned is e.g. as [you] one can see in the US-A 5 364 074, the EP - A 0 479 529 or the WO 94/05536, whereby it is tried, to trace the position of a vehicle with the help of transmitter-receiver-units along the route and to compare with the data related to distance. Furthermore in these known types special data are transmitted to a control station, which can transmit the data related to the train to further rail-vehicles.

[0008] The present invention is [aiming at] directed to the creation of a [procedure] method as well as at a system to locate and survey the position of at least one track-guided vehicle, especially a rail-vehicle, and at the emission of warning signals, with which the reliability and security of availability can be enormously increased, whereby especially mistakes in the control station [respectively] and problems of an information exchange between one vehicle and such a control station [not immediate] may lead to a [eventually] totally complete falling out of the system and combined with this to security-risks.

[0009] In order to solve these [targets] problems, the present invention for automatically [locating respectively] detecting and monitoring the position of at least one track-guided vehicle, especially of a rail-vehicle, and for the emission of warning signals of [that] the above-mentioned kind [mentioned in the beginning] is essentially [characterized]

charaterized through that[, that merely] when dangerous situations arise, the vehicle sends warning signals at least to other vehicles being in the local close zone, especially to other vehicles which use another distance than the immediate practicable distance. As in the vehicle, preferably continuously, the position of the vehicle is located and surveyed and also compared with the previously given data, can the accordance of the determined and acquired data, e.g. the position, the speed, the time and the like be surveyed immediate in the vehicle by a determined distance without engaging a control station and resultantly immediate in the vehicle can be [recognized] recognized, if differences to a previously given distance or the like occur.

[0010] Also other track-guided vehicles will be regarded as vehicles in the present invention beside the usual rail-vehicle vehicles, e.g. as robot-directed vehicles in warehouses or the like, which e.g. are directed along from tracks in the floor or the like and emit electromagnetic signals. Alternatively, it goes without saying, that vehicles being directed via other control systems are also included, which move alongside of determined tracks, whereas crossings result similar to those like with such general, track-guided vehicles. These crossings must be separately controlled by the use of such eventual fully automatic driven [respectively] and directed vehicles.

[0011] According to invention, it is furthermore foreseen, that the vehicle can send warning signals at least to other vehicles being in the local close zone whenever dangerous situations [respectively divergence] diverge from a determined track, occur, so that a essential element of this invention is, that a direct communication between vehicles lying or plying in the local close zone is possible, without absolutely inserting a higher ranking control station.

[0012] [Vis a vis] Viz-a-viz the types of the known state of the art, through this possibility of direct communication between vehicles being in the local close zone not only [that] is the transfer time of the data, which indicate a dangerous situation, [is] reduced respectively with the transfer of warning signals, but it is also possible to avoid respectively to enormously [minimize] minimize additional safety risks, which eventually arise by mistake in a control station. According to invention[in its] , it is possible to transfer the message of dangerous

situations [respectively] and warning signals [also] to an corresponding control station, in order to provide especially for track-vehicles [eventually over regional] using nter-regional information exchange.

[0013] According to the proposed arrangement of transmitter-receiver units [respectively] locating elements in the area of practicable rails [respectively] , namely, tracks, enables [to use] the use of elements with very low transmitting power, which assures that only vehicles on the associated track can receive a [respective] particluar direction signal.

[0014] A very favourable development in the present invention is, that the locating of a vehicle, especially of a rail-vehicle, is independent from each other in lengthwise direction as well as in transverse direction. Locating mistakes crosswise facing the engine therefore become negligible, [respectively] and will be totally eliminated, whereas they essentially depend on the radiation lobe in the lengthwise direction of the tracks. Locating mistakes can be kept small by the correlative directionality of the transmitted wave, e.g. by laser. Low-cost transmitter-receiver units, provide a correlative exact locating with merely a single piece of equipment without using complicated additional systems, which are much more expensive with increasing frequency of mistakes.

[0015] A special advantage according to invention is, that an entire [break down] breakdown of the whole system, like with other systems, especially with those, which base on a satellite-receiver, is totally impossible, as according to invention there are autonomic units concerned, which either are installed mobile or stationary as stationary relay, in the rail-area or in main control station or collateral unit. These autonomic units together provide an automatic, individual and direct communication between other rail-vehicles, stationary relays, locating elements, control stations the like, which are in the local close zone.

[0016] Dangerous situations arise [e.g.] out of the variance of the security-system according to invention, which is foreseen in the vehicle, especially rail-vehicle and can e.g. be as follows:

- stop of a vehicle (danger of crash with a following vehicle)
- overrunning of a stop-point or signal, whereas the following danger-point is overrun
- a crash with a crossing or joining vehicle,
- belated reaching of an intersection or of a shunt-area
- deviation of the prescribed route (other rail)
- uncontrolled undocking of a freight car or similar

[0017] In order to distinguish different dangerous situations, the vehicle sends different warning signals, so that other vehicles can react accordingly, as [e.g.] an emergency stop in the immediate danger of crash or a decrease of the speed, etc.

[0018] Alternatively, one could out of the emission of a widely [standardized] standardized warning signal, under consideration of the mutual position of the vehicles, adequate countermeasures could be derived and [beginning] begun.

[0019] According to a special preferred type of invention, it is proposed that the vehicle emits favourably analogue data concerning its position and identification to other vehicles, being in the local close zone and/or to control stations, so that other vehicles not only in dangerous situations in at least one local close zone are informed, but a continuous mutual control [respectively] and communication concerning the most important keydata of the single vehicles is provided.

[0020] For a further increase of security, it is moreover proposed, that the vehicle receives preferably continuously information about the position and identification of the other vehicles in the local close zone and compares them with the determined data concerning the [move] movement of an indicated distance and checks them for eventual dangerous situations, [what] which corresponds to a further preferred type according to invention, whereas a continuous communication with other rail-vehicles in the local close zone is not coercive.

[0021] In order to further increase the security, it is moreover favourably proposed, that it is

preferably continuously controlled, if the warning systems is available and/or if the transmitter-receiver units installed in the [are] area of the practicable rail [respectively] and the trails are operating, and warning signals will be emitted when a mistake occurs and/or a stop of a vehicle is effected.

[0022] Such a check [respectively] and control of the availability of the warning systems and a check of the [operating] operation of the transmitter-receiver units in the area of the practicable rails enables a further increase of the reliability of service of the whole system, whereas e.g. following situation of a [break down] breakdown of one receiving system must be distinguished.

[0023] As already mentioned, the total [break down] breakdown of the system according to invention is not possible. A possible defect may arise either in one part of the system, which is located in the vehicle or at a locating element or a stationary relay. In all cases [can] , in the above mentioned single-units of the security systems according to invention of self controlling-system, connected with an own sender and/or audio-optic signals be installed. This self controlling-system sends in case of a defect e.g. encoded warning signals to vehicles, especially rail-vehicles, stationary relays and/or control stations being in the local close zone, which [identificate] identify and indicate the occurred interruption.

[0024] Beside such a check-up of the availability of the warning systems, also the transmitter-receiver units being installed in the area of the practicable rails [respectively] and tracks, must regularly be [controled] controlled and checked, if they are operating, whereas in this connection if a mistake at a transmitter-receiver unit occurs, e.g. a message to the control station can be sent. In case that several vehicles each deliver a mistake or a defect of a special transmitter-receiver element, it is sure, that this transmitter-receiver unit is the defect, so that a repair of the defect has to be occasioned. Furthermore, it can be necessary to reduce the speed by braking of a vehicle to avoid potential accidents, with a [break down] breakdown of one of a special position provided transmitter-receiver-unit.

[0025] For another check-up of the system and a comparison of existing data with the

determined route, a further preferred type is according to invention foreseen, that a accumulation at least of the data of the preceding transmitter-sender units is provided and these data together with the vehicle's identification data are given up with the emission of a warning signal. In this context, [e.g.] changes of the schedule[,] carried out through a control station can be considered and if necessary, confirmed. In connection with such a self controlling of the availability of the warning systems and a check-up of the operability of the single transmitter-receiver units, especially at special positions, respective redundant systems, which can control itself, can eventually also be provided.

[0026] For an orderly and exact [localization] localization of the position of the transmitter-receiver-units, provided in the area of practicable tracks [respectively] and rails, it is further proposed according to invention, that the transmitter-receiver units, installed in the area of the practicable rails, are furnished with [a] an encoding, e.g. with geographic coordinates, whereas beside geographic coordinates, e.g. additional identification marks can be conducted. Such a definite identification of transmitter-sender units in the area of the practicable rails permits also for rail-vehicles the construction of an [overregional] inter-regional/international system with respective encoding of the rails and tracks in [a overregional] an inter-regional area.

[0027] [A] An encoding [respectively] and control of the transmitter-receiver units of the in the area of the rails provided units can also be carried out e.g. by laser and therefore immediately a check-up can be done, without a further communication between the units in the area of the rails and the units in the vehicles.

[0028] In order to assure a reliable communication [respectively] and transfer of data between different [system,] systems of vehicles, especially within the international traffic, a further preferred [type according to] embodiment of the invention is proposed in this way, that warning signals preferably are transferred by international signal-and warning frequencies.

[0029] Beside the [above discussed procedure] above-discussed method according to

invention for the locating [respectively] and monitoring of the position of at least one vehicle and for the emission of warning signals, a system to solve the [mentioned above] above-mentioned tasks is moreover proposed. This system for the automatic locating [respectively] and monitoring of the position of at least one track guided vehicle, especially rail-vehicle, and for the emission of warning signals, whereas there is at least one unit for locating and monitoring of the position under assistance of a sender-unit [respectively] or combined transmitter-receiver-units, which are installed in the area of the travelling on tracks [respectively] and rails and for the comparison of determined [respectively] and previously given data with data concerning an indicated distance to be moved. Furthermore, it is foreseen, that a unit for emission and for receiving of warning signals at least to other vehicles, being in the local zone, especially to those, which drive on another distance than the immediate driving on route, merely when dangerous situations occur.

[0030] The system according to the invention [succeed] provides a reliable control of a vehicle's route, especially of a rail-vehicle, [and] as well as a comparison with a determined parameter of a indicated distance as well as [also] in the case of the occurrence [respectively] and identification of dangerous situations at least the immediate emission of warning signals to other vehicles and eventually [additional] additionally to control stations, being in the local close zone.

[0031] According to a special preferred [type] embodiment of the invention, it is proposed in this connection, that the equipment, installed in the area of the rails [respectively] and tracks, [build] consists of at least a unit for emission of a signal respectively encoding, which shows the position of the unit, e.g. of geographical coordinates, whereas a simple control of the position of a vehicle while driving on a route is provided, whereas in this connection moreover it is proposed, that a unit for receiving and registering of a vehicle's keydata is additionally foreseen.

[0032] According to another preferred type of the invention, it is proposed, that in the vehicle, units for locating and monitoring the position as well in the front area of the vehicle,

especially in the locomotive or in another actuation element, as well as in the rear area, especially in the last freight car, are foreseen, whereas especially with long vehicles, e.g. freight trains, which eventually drive rather slowly, the required time for the driving on a determined route-section can be considered and, at the same time, it can be controlled if the whole train is complete.

[0033] Beside the check-up of the completion of the train [respectively] vehicle, it is possible to reach e.g. by overrunning of shunts/turnouts a higher control and security, as well for the beginning and as for the end of a rail-vehicle, the correct driving on a shunt/turnout can be controlled. It is hereby preferable, to use control means, with which the front end of a vehicle corresponds to a closed circuit condition and the aft end to a turn out-modus, so that always it is assured, that a vehicle e.g. had completely left a crossing, before the freeing of the route is carried out.

[0034] Because of the automatic control, it is possible to make a respective contact between the system in single vehicles or also to [recognize] recognize, if a vehicle is not equipped with the system according to invention.

[0035] For [a] an automatic and simplified control and controlling means, it is moreover foreseen, that the units for locating and monitoring the position in a vehicle, for comparison with data and for emission concerning the route and receiving of warning signals, connected with a common control- and computer-unit or preferably integrated in this unit, as this corresponds to a further preferred type according to invention.

[0036] For an automatic control [respectively] possibility to avoid accidental situations with [locating] the location of potential dangerous situations, it is furthermore proposed according to invention, that the equipment for emission and receiving of warning signals is coupleable with driving parameters of the vehicle, e.g. a reduction of the speed by braking, and is feasible, so that e.g. by locating of dangerous situations through influencing the drive-parameter, e.g. through a reduction of the speed by braking, accidental situations can be

[selfinstructed] self-instructed and automatically be avoided without delays, whereas such a [delays] delay would be caused by e.g. not an automatic communication systems.

[0037] As above suggested, it will be achieved in the range of the [procedure] method according to the invention as well as the system according to invention, with simple transmitter-receiver-units with low power, whereas in this connection according to a further preferable type of the invention it is proposed, that the in the area of the tracks [respectively] and rail, provided units include transponder and/or emission-units for a laser mark. [for] For a simple transfer of the signals respectively warning signals it is proposed according to a preferred [type] embodiment of the invention, that the transfer of signals, especially warning signals, is carried out via radiotelegraphy or cable-connections, especially glass fiber cable [respectively] via the rails.

[0038] In order to check-up [respectively] and control concerning the operating [respectively] and the availability of the systems according to the invention, it is proposed according to a further preferred [type] embodiment of the invention, that [at respectively in] the vehicle additional indictors, especially traffic light equipment, for indicating the operability of the system, are foreseen. In this way, especially a visual control concerning the readiness for service of the system is possible, whereas, e.g. [respective] traffic signals as well outside at the rail-vehicle a control by passing by rail station/railroad depot and as also in the freight cars can be a moderation for the passengers. The invention is explained in the following by the enclosed [pictures] figures showing the diagrammatic viewed examples of the system according to invention for carrying out the [procedure] method according to the invention.

BRIEF DESCRIPTION OF THE FIGURES

[0039]

Fig. 1 is a [A] diagrammatic view of a system according to invention for locating [respectively] and monitoring the position of at least one vehicle, especially of a rail-vehicle, for carrying out the system according to invention;

Fig. 2 is a [A] diagrammatic view of the different signal-[respectively] and wireless-elements;

Fig. 3 consists of Figs. 3a and 3b which are [Schematic] schematics of the possibilities of a vehicle's connection with transmitter-receiver-units [respectively] of a higher control-station;

Fig. 4 is a [A] block-diagram for a system according to invention for locating [respectively] and monitoring the position of at least one vehicle and for emission of warning signals for carrying out the [procedure] method according to invention with further poke-home transmitter-receiver-units; and

Fig. 5 is a diagrammatic view of a transfer of signals between vehicles, especially rail-vehicles.

DETAILED DESCRIPTION OF THE INVENTION

[0040] With the system for locating and monitoring the position of at least one track-guided vehicle, especially of a rail-vehicle, and for emission of warning signals, it succeeds through an early emission of warning signals [and to avoid] for avoiding accidents [through] by means of a direct communication between vehicles being in an immediate local close zone with the help of direct connections under use of especially international alarm- or warning-frequencies.

[0041] The following description refers to a type of [realization] realization in connection with rail-vehicles. Alternatively, the vehicle can be constituted e.g. of self-driving [respectively] automatic prosecuted vehicle, which drive an along determined tracks respectively railroads, whereas leading tracks are developed e.g. in a ground area, which emit electro-magnetic rays for leading or guiding of such vehicles. In this way, such [a] tracks [respectively] and guiding rail-roads replace the rails of a rail vehicle.

[0042] In this connection, a locomotive is [named with] indicated by 22, in [fig. 1] Fig. 1, which drives on a schematic with 21 being the marked distance, whereas in the distance, e.g. between the stretch of rails and the rail road ties, [an amount] a number of transmitters 18 is provided, which will be explained in detail in [the following] hereinbelow.

[0043] In the locomotive 22, there are respective receiver-and eventually transmitter-units integrated, which under the reference to Fig. 4 will be discussed in detail. Further, [there is also] in with 22' marked, the last segment [respectively] , namely, the last wagon of the train there is also a receiver-unit provided, so that especially with long trains the necessary time for the passage of trains of a distance can be considered and eventually the completion of the train respectively the proper passing over of the turnout can be controlled.

[0044] Through the comparison of the determined data, emitted by the transmitters 18 and from the respective receiver-units as in the locomotive 22 and as well eventually in the last wagon 22' provided signal-receiver-units concerning the distance to be travelled on it succeeds a simple control of [a] proper traffic, whereas [in] upon occurrence of dangerous situations [respectively differences] a difference from the determined data an emission of signals is made possible, as [this] will be discussed in detail with respect to the the following figures[in detail]. In this connection in [fig. 1] Fig. 1 with 30 schematically implying the emission of warning signals [is schematically implied], whereas 24 implies a receiver-antenna.

[0045] The reference-marks for the same components in [Fig.] Figs. 2 and 3 are the same like in the preceding figure. The element 24 marks a receiver-unit at a trail-vehicle marked as 22, which is driving on the distance 21 e.g. in the direction of the arrow 32. In [fig. 3b] Fig. 3b there is further implied a control-station 27 and an additional receiver-unit 26.

[0046] In the block-diagram according [fig. 4] Fig. 4, the processing and emission of respective control-signals with the driving on of a distance is hereby especially detailed implied. In [fig. 4] Fig. 4, there is an arithmetic unit respectively control-unit marked with 1, whereas signals are transmitted via lines 10, 11 from the duplex-units 3, 4 to the control-

station 1. The duplex-units 3, 4 are connected to the transmitter-units 18, which are integrated in the distance. Further signals of a duplex-unit 8 are transmitted via a control line 9 to [a] an arithmetic unit 1, whereas the duplex-unit 8 is connected with a duplex-unit 19. [The] In Fig. 4, the marks 5, 6 and 7 in [fig. 4 are naming] identifiers of schematic determined data concerning the distance to be driven [on], which are provided via the control lines 12, 13 and 14 to the arithmetic unit 1. [Hereby 5] Mark 5 is e.g. a timing pulse generator, 6 is e.g. an electronic map, in which a rail net with respective geographic data and the position of the single transmitter-units 18 are shown, as they are integrated in the distance, while mark 7 [marks] indicates a detailed plan of the distance to be driven [on], which is coupleable with another transmitter-receiver-unit 17. According to a comparison of the real position-data, provided by units 3 and 4, with those provided by 5, 6 and 7 to the arithmetic unit, the compatibility of the driven distance of trail-vehicle 22 with the determined and pre-stored data can immediately be ascertained. The units 18, 19 which have to be provided in the distance can be protected from interferences and eventually modularly removable, e.g. created like a black-box. Furthermore respective encoding for the distance, the position of the transmitter-units 18 and such like, can be foreseen.

[0047] [The] Furthermore, the transmitter 19 [furthermore] has an additional function in [fig. 4] Fig. 4. It controls [, if] when the driving past rail-vehicle is without a security-system or a vehicle [, which's security system is not working, is defined as] with a non-operational security system [, is defined as] ("problem-vehicle"). In order to [recognize] recognize "problem-vehicles", it is necessary to install at the beginning of the distance, which is equipped with locating elements according to the security system of the invention at stationary points of danger, e.g. after the last turnout of a railway station, before and after turnouts, crossings and/or others, grade crossings, etc., a "registration-system" ([fig. 4] Fig. 4, transmitter 19 and 20), in order to [recognize] recognize a "problem-train" and to emit warning signals in case of necessity, what is working like that: If the transmitter 19 (only for question and answer from the train) does not receive an answer to [his] its enclosed, transmitted signals from the driving past rail-vehicle, it recognizes that as a "problem-train" and induces the activity of the transmitter 20, which sends encoded warning signals via wireless and/or communication-cable e.g. to trains in the local zone, stationary relays and

main- and/or side-control stations. The transmitter 19 can also induce the activity of visual and acoustic signals. The transmitter 19 can be activated through a driving past rail-vehicle, e.g. via a commonly known magnetic-relay, magnetic-relay, magnetic-rail-contact, wheel-sensor and [alike] the like. Because of this activity the transmitter 19 sends a signal via antenna 23 to the driving past rail-vehicle, whereas it, if it does in case not receive an answer from of the driving past rail-vehicle to these encoded, transmitted signals, [recognizes] recognizes this vehicle as a "problem-train", which either is not equipped with a security system or consists of one that does not operate. Furthermore, [is with] in Fig. 4, mark 2 [in fig. 4] is a duplex-receiver unit implied, with which respective information of other rail-vehicles being in a local close zone are received[respectively] and through which data of the rail-vehicle from the arithmetic unit 1 to other rail-vehicles being in a local close zone can be transmitted, whereas signal lines are implied with 15 and 16. Comparing the provided data through the duplex-unit 3 and 4 with the determined data 5, 6 and 7 and those of others rail-vehicles received data via the unit 2, immediate statements above eventual possible dangerous situations, whereas by occurrence of such dangerous situations respective warning signals, as implied through 31, can be emitted. Furthermore, [can] through the unit 1, while receiving signals [marking] indicating a dangerous situation immediate e.g. the actuation of the rail-vehicle can be influenced, so that automatically a [reduce the] speed reduction by [breaking] braking can be carried out.

[0048] The transmitter-units 18 respectively 19, which are integrated in the distance, can hereby contain beside the exact position also a respective encoding, in order to enable the simplified control of the position of a rail-vehicle. In [fig. 4] Fig. 4, there is hereby [additional] additionally implied, that beside the unit 19 also a transmitter 20 can be foreseen, which by [recognising] recognizing problems in connection with a driving past rail-vehicle [immediate] immediately via the antenna 23, which also in [fig. 3b] Fig. 3b is schematically implied, enabling a notification [respective] and release of an alarm to a control station or a transmitter 26 [respective] and 27, whereas transmitter 20 emits respective warning signals.

[0049] In this connection it can be [recognized] recognized, if a rail-vehicle is not equipped with such a system respectively if a [break down] breakdown of the system happened. Beside

wireless signals, it is also possible to transfer signals via cable or to emit visual signals, if a wireless communication, as e.g. in a tunnel, beside military check points or airports, is not easily [respectively] and not possible at all or light signals supporting are implanted.

[0050] The system according to the invention hereby can integrated without further problems in already existing rail nets and rail-vehicles with low costs and simply under use of already known transmitter-receiver-units, whereas especially through the implementation of international alarm- or warning frequencies also a simple modulation between train systems, eventually from different countries can be enabled. Hereby, it needs merely very small building instruments with low consumption of electric energy, which eventually can be operating for [the in] the distance having integrated elements with solar cells or long-term batteries, whereas under warranty of effective output and long functional duration an independence of an external supply of energy, e.g. via electric lines, is enabled. As respective duplex-units are integrated in stationary relays [respectively] as well as transmitter-units, the assembly and application will be furthermore simplified.

[0051] The system according to the invention and especially the transmitter-receiver-unit implied in [fig. 4] Fig. 4, to be arranged in a rail-vehicle, which via the signal piece parts essentially take the control, can eventually be foreseen also in a portable unit, so that rail-vehicles either can be easily [backfitted] retrofitted or [can e.g.] , in the transnational traffic, can be easily [implanted into] installed in rail-vehicles, which are not yet equipped with the system according to invention, in order to enable a [respective] reciprocal communication with other rail-vehicles under a standardized system.

[0052] Furthermore, it is possible to transfer the signals with already known equipment in a reliable way either in the form of merely warning signals or a continuous transfer of data of the single rail-vehicles to [further] other rail-vehicles being in a local close zone or additionally to higher ranking control stations.

[0053] In [fig. 5] Fig. 5, there is a schematic crossing-situation at several trails 34, 35 and 36, whereas the trails 34 and 35 are parallel and cross a trail 36. [Such] According to the

invention, such a crossing marks for the system [according to invention] a stationary dangerous point, which has to be controlled [respectively] and to be reorganized, at which e.g. at least two rail-vehicles can meet one against the other. Other stationary dangerous points are e.g. rail road crossings with streets or other grade crossings. Opposite to that variable dangerous points are situations, whereas e.g. a rail-vehicle eventually because of a mistake or [break down] breakdown stands still or overrides a stop-point or a signal, so that a collision with following or previous rail-vehicles is possible. The single rail-vehicles must be able to recognize, if the coming in warning signal of one rail-vehicle in the nearby is relevant for the continuation of the train ride for if [e.g. for the reason that] the rail-vehicle had already passed a dangerous point, no reaction is necessary.

[0054] In [the] connection with the control of stationary dangerous points, [can a] control of grade crossings [e.g] can be carried our in [this] way of an area-monitoring or a monitoring of such a [grad] grade crossing with light-barriers, inductive loops or weighing equipment, so that [e.g.] a hanging up vehicle, which had not yet entirely left a track, can be detected and in this way through the emission of respective signals via the in the track-area implanted transmitter/receiver-units enable respective counter measures against other coming close rail-vehicles similar to [a] an already-known automatic control while coming close to an automatic shutting gate installation. If a road-vehicle stands still on a railway-crossing, consequently, it is possible, to send a warning signal to rail-vehicles entering the close zone, e.g. through the implementation of a speed-depending activation of a safeguarding plant of a railway-crossing. Also the speed-depending self-instructed operation, [whereas] wherein the vehicle at the signal box self-instructed releases the adjustment of the train track, would be possible, whereby results in a [big relief] reduction of routine work for the operator of the safeguarding plant.

[0055] As it is shown in [fig. 5] Fig. 5, the schematic [implied] indicating rail-vehicle 37, which moves in direction of the arrow 38, emits warning signals, as [implied through] reflected by the arrows 39. For a rail-vehicle 40, which moves in direction of the arrows 41, the received warning signals are not relevant any more, as the rail-vehicle 40 had already passed the crossing between the rails 34 and 36. Opposite to that the emitted warning signals

for the rail-vehicle 37 are relevant for a further rail-vehicle 42, which also is moving in direction of the arrow 41, in order to avoid a collision in the area of the intersection between the rails 34 and 36. In case [that] another rail-vehicle 43 on the track 35 can also receive the warning signals, so [are] these warning signals [also] for this rail-vehicle are not relevant anymore. [Opposite there are however,] However, for the other rail-vehicle 44 and 45, which come closer to rail-vehicle 37 corresponding to arrow 46, [also] these warning signals are relevant, so that either an immediate [reducing the speed] speed reduction by braking of all vehicles must be carried out or at least it must be attempted, so that [the] vehicles 44 and 45 [e.g.] can resort to track 35 via respective turnouts, such not being described [not] in detailed.

[0056] In the area of the tracks respectively rails 34, 35 and 36 respectively transmitter/receiver-units are hereby implanted in regular space for monitoring the position, whereas one of these transmitter/receiver-units is marked with 47. These transmitter/receiver-units 47 can hereby consist of, beside the geographic co-ordinates, additional data about a special track and such like, whereas with respective [overregional] inter-regional numbering of the track plants also e.g. transnational systems can be constructed.

[0057] A later adjustment [respectively] or change of schedules respectively of set values, especially in the rail-vehicles, is simple and easy to be accomplished, e.g., from main- and/or side control stations, through the already known methods of wireless via the transmitting of encoded signals to the system part according to invention integrated in the rail-vehicle, in order to carry out the desired adjustment or change automatically, whereas the main- and/or side control stations must receive a [back-confirmed] reply-confirmed answer from the system (automatic transfer of a change). It is additionally possible, that the locomotive drive receives e.g. by wireless an order to change, whereas arrangements must be made to avoid misunderstandings. The [permit of] permission for such a change can only be enabled by use of [solemnly used] a protected password, that [he] is received from a main- and/or side control station by wireless, internet and/or such like. The locomotive driver must confirm the received information through an immediate [back-message] reply-message to the main and/or side control station, preferably written, e.g. via internet, or also orally, in order to avoid any kind of misunderstanding and [therefore guarantee the] thereby guaranteeing security.

[0058] If a further rail-vehicle stands [still] stationary and does not drive or for longer time [respectively] is not permitted to continue the journey, it emits warning signals, in order to inform of eventually following rail-vehicles [from] of the unchanged stop.

[0059] It is a further advantage of the system, that the [present] current position of all [rail-vehicle] rail-vehicles while driving on [its] a particular route can be identified on a switchboard [in] at the station management or monitor control, and not only, as presently usual, e.g., by wireless between rail-way stations and control stations. Such a [locating] detection can be carried out without any contact by wireless or without the use of communications elements and in this way without deviation of the locomotive driver [be carried out, that] , which means, if no warning message is received [of] regarding the rail-vehicle, that a train systematically and without any interruption had passed [his] its route [respectively] and is on its way between locating points being defined as set locating points.

[0060] Similar to the [above described] above-described types of performance for rail-vehicles [respective] as well as risky [respectively] and dangerous situations are in general possible for track-guided vehicles, as also with such track-guided vehicles crossings with similar constructions result, where a close coming [closer] together of moving vehicles at the same time or a collision between [those] them must avoided in a reliable way.

[0061] While preferred embodiments of the present invention have been described, it is to be understood that the embodiments described are illustrative only and the scope of the invention is to be defined solely by the appended claims when accorded a full range of equivalence, many variations and modifications naturally occurring to those of skill in the art from a perusal hereof.